

## Research Article

# Development of Pyrex Glass Handcraft

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**Abstract.**

One of the crafts with aesthetic value and much loved by many levels of society is made of glass, but it is still rare to engage in this business. Therefore, the author tries to develop works to be used as a new venture or art expression. Data were collected by conducting studies of glass processing companies, interviews, visits to field locations, visual observations, and literature studies. This was done to understand the manufacturing process. The stages of solving the problem are carried out through the design thinking method process step and its implementation by applying design theory and preparing the required work equipment. The result of this research was a product in the form of a prototype. It is hoped that this design research can be helpful and a reference for developing design works or the basis for further research.

**Keywords:** art, aesthetic, design work, glass craft

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## 1. Introduction

The government continues to support the growth of the handicraft industry because this sector contributes considerably to the growth of the national economy. According to the Director General of Small and Medium Industries of Indonesia's Ministry of Industry, handicraft exports for the January- December 2022 period of 10.6 trillion increased by 6.94% compared to the same period in the previous year [1]. This condition is a considerable opportunity for business actors to continue producing in the handicrafts they are engaged in. Therefore, for this craft business to continue and compete competitively, it needs collaboration between business actors, designers, marketplaces, and academics to improve and give birth to innovations for its development.

One handicraft field that has the prospect of being developed is the one made of glass because the public loves it and has the aesthetic value of the products it produces, so this glass craft business can be a choice of business opportunities in this country that can be used as one of the export commodities. History records the discovery of the



oldest glass artifacts in Mesopotamia in the 3500th century BC, and 1000 years later, the Egyptian people made jewelry, sculptures, animals, and mosaics from glass and expanded to parts of the world until now [2]. However, there are still few who pursue this glass craft. The effort to develop the craft is to innovate products, either making new designs (innovation) or improving products from existing designs (enhancing existing drawings). In realizing this, the involvement of designers plays a vital role because the collaboration between industry and researchers is expected to be able to meet the expectations of consumer needs. The design thinking philosophy emphasizes that innovation is a process of achieving goals through research, development, and marketing [3]. So, the purpose of this research is to make developments in creating works that can be used as a new venture or as an expression of art. Previous studies on craftsmen of glass craft processing included making stained glass, mosaics, painting on glass, glass frames for photos, and flower vases. Therefore, as a literature study, the author visited a company in Bandung that processes glass into finished products, as shown in Figure 1.

## 2. Research Methods



**Figure 1:** Manufacture of Laboratory Products from Glass Material. Source: Processed by Researchers.

This research was conducted through the approach of the stages of the design solution process. Design is problem-solving, starting with the customer and ending with the customer, which initiates changes in artificial things and is an innovation that

turns ideas into information through simulation [4]. From this understanding, it can be understood that design is a science and a way of thinking to produce works that are useful for the benefit of people because of the need (desire) for the continuity of life (viability).

The data is collected through interviews, observations of spaciousness visits, and literature studies. In contrast, the research process is carried out using the stages of the design thinking method, a problem-solving method that focuses on users finding solutions effectively and efficiently [5], which is carried out in a structured manner that begins with the empathy stage. In the “empathize” stage, we visit the glass industry to get information for the process of obtaining data on an approach to the object of the problem, which will be researched to understand and get a deeper nuance of feelings about the problem, so that we are emotionally involved in it to find a solution to a need that can benefit society. The second stage of the design thinking method is “define.” We try to understand how to find out the manufacturing processes of glass. The collected data is then converged to find many ideas to realize three alternative design solutions to these problems and make them in prototype form.

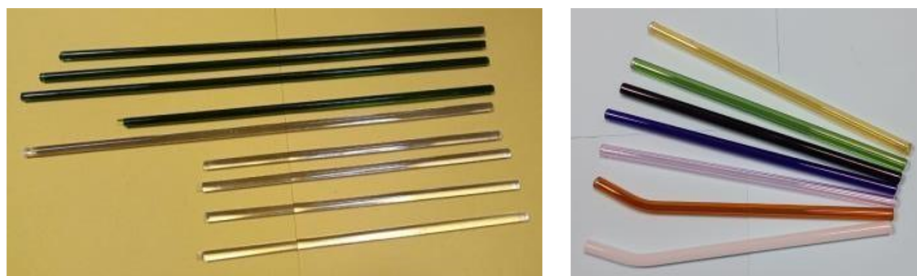
### 3. Result And Discussion

#### 3.1. Empathize

Conduct field surveys and interviews with companies of Dichandra Laboratory Glass, which produces a wide range of glassware, chemical tubes for laboratories such as measuring cups, and special equipment such as oil separating cups, distillation devices, and extractors. From the data submitted by Mr. Adi, the head of the company, it was found that the material used was Pyrex material, whose procurement was still imported from Japan.

#### 3.2. Define

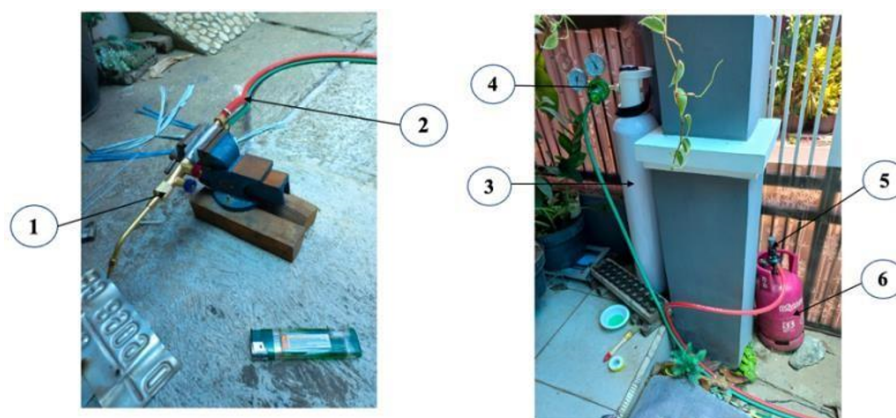
The material it uses is a type of Pyrex or Borosilicate material, as shown in Figure 2, where the formation process temperature is between 820-1560 °C [6] or a softening point temperature of about 820 °C and a working point of about 1270 °C [7], as for the annealing point temperature of this material is 565 °C [8] with the aim that, after the formation process, the inner voltage between molecules becomes evenly distributed.



**Figure 2:** Pyrex or Borosilicate Material. Source: Processed by Researchers.

Preparing necessary working equipment as shown in Figure 3:

1. Torch
2. Hose
3. Oxygen Cylinder
4. Oxygen Regulator
5. Gas Regulator
6. Gas Cylinder



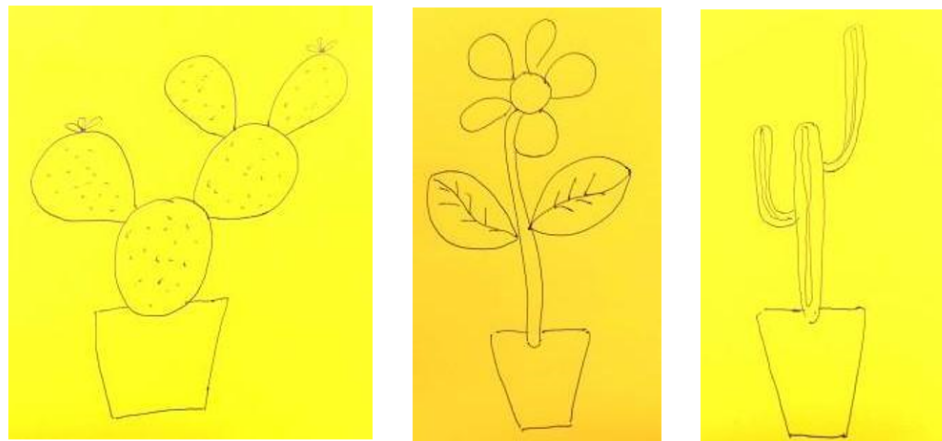
**Figure 3:** Working Equipment. Source: Processed by Researchers.

### 3.3. Ideate

Several alternative design plans are attractive by making images visual because images have a persuasion function that can convey the meaning of the representation of a product by considering aesthetics and design principles [4]. Design work will look more attractive if the elements attached to the work form a character that corresponds to

other elements the application of design principles such as unity, balance, rhythm, and proportion plays a very important role in making a work because it will produce a work that looks more aesthetic [9].

Sketching creation of 3 (three) design alternatives as shown in Figure 4:



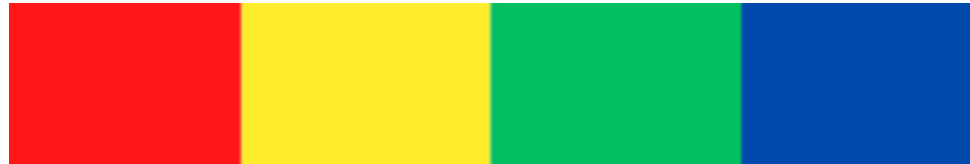
**Figure 4:** Alternative Sketching of Glass Craft-making. Source: Processed by Researchers.

### 3.4. Prototype

The peculiarity of glass crafts is their shiny shape and attractive color like the primary material. Glass can be made into various shapes using high heat, for example, made into craft products that have high value, such as Planes, cars, motorcycles, animals, flowers and other miniature models. The design selection is adjusted by considering the manufacturing capabilities that can be implemented in the form of products that can be made. Design is a blend of art that expresses the artist's expression of taste and is implicated in a work supported by science and technology. Technology plays a role in facilitating the artist's work to produce more beautiful and exciting works because the value of the work produced by the creator is attached to the character of the work he makes [10].

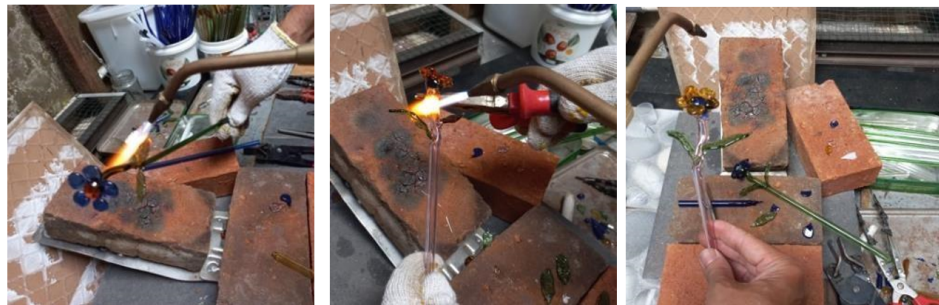
The choice of the use of color is very important in producing the beauty of the product to be made because each color has meaning visually and can affect the emotions of those who look at it; for example, contrasting color colors can give a dynamic and festive impression or vice versa soft color colors convey a message of softness, tranquility and romantic, the selection and use of primary, secondary and tertiary colors is a visual attraction to attract consumers in making a design work [11]. Color is a visual element that stimulates vision [12]. Color can also give character to a design work [13]. Color

contrast occurs when we compare one with another. For example, blue is juxtaposed with yellow so that a difference will stand out more from the border of the two colors, as shown in Figure 5.



**Figure 5:** Influence of Color Selection. Source: Processed by Researchers.

In the glass forming process that uses a hot process, as shown in Figure 6, after the product has been made, it is important to carry out the annealing process by re-heating it at a temperature lower than the temperature of the forming process and allowing it to cool until it reaches room temperature. This is intended to equalize the structure inside of the glass that has been made. In order to avoid making cracks in the resulting products.



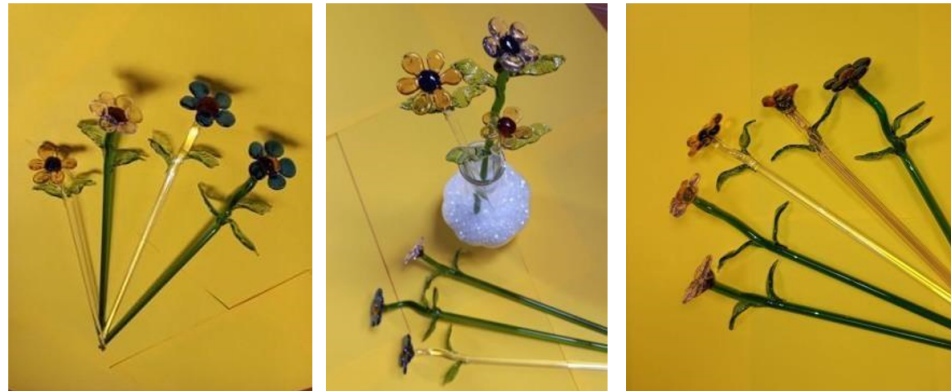
**Figure 6:** The Manufacturing Process of Glass Handicraft Prototype. Source: Processed by Researchers.

The result of this prototype is in the form of a flower sprig of Pyrex or borosilicate material that can be displayed in a flower vase that can be used as a home decoration, as shown in Figure 7. We can arrange several flower stalks into a vase to make it look more beautiful and harmonious.

## 4. Conclusion

The manufacture of glass crafts developed from the laboratory tube-making business can be used as a reference for the modeling stage of research for the development of new businesses or an expression of the passion for artistic values that can be used as a stage of the advanced research process. In the manufacturing process, it is important to carry out the annealing process so that the inner structure of the glass is evenly





**Figure 7:** Glass Handicraft Prototype Results. Source: Processed by Researchers.

distributed to avoid cracks caused by temperature changes. Further research is needed at the testing stage to avoid cracks and determine the consistency of prototype stability after storage at room temperature. Advice for those who will try to make glass crafts: You can start by using materials made of pyrex or borosilicate materials around us, such as glass straw materials. Aesthetically, the results of this prototype have attractiveness, beauty, and uniqueness because they are made of glass material that has transparent properties so that it looks sparkling beautifully and harmoniously when exposed to lighting; combined with the use of contrasting colored materials, they will blend to make the prototype more captivating.

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